

حمل الآن

مجاناً وحصرياً

# المراجعة رقم (1)

اختبار شهر نوفمبر



**What is meant by .... ?**

|                              |                                                                                                                                                                                                                     |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Heat</b>                  | The energy that is transferred from one system to another or to the surroundings due to a difference in their temperatures.                                                                                         |
| <b>Thermal equilibrium</b>   | The state reached by two systems with different temperatures after they come into contact and their temperatures become equal.                                                                                      |
| <b>Thermal conduction</b>    | The transfer of thermal energy through solid objects from one point to another without the particles moving from their positions.                                                                                   |
| <b>Thermal conductivity</b>  | The measure for the extent to which a substance can conduct heat through it.                                                                                                                                        |
| <b>Thermal conductors</b>    | They are good heat-conducting substances (their thermal conductivity is high).                                                                                                                                      |
| <b>Thermal insulators</b>    | They are poor heat-conducting substances (their thermal conductivity is low).                                                                                                                                       |
| <b>Thermal convection</b>    | The transfer of thermal energy in fluids with the movement of their particles.                                                                                                                                      |
| <b>Sea breeze</b>            | Cool air (breeze) blowing from the sea towards the land during the daytime.                                                                                                                                         |
| <b>Electromagnetic waves</b> | Waves that propagate (travel) through space at very high speeds reaching 300,000 km/s in all directions.                                                                                                            |
| <b>Thermal radiation</b>     | The transfer of infrared radiation from the surfaces of objects, especially hot objects, without the need for material particles.                                                                                   |
| <b>Thermography</b>          | A technique that uses a camera to detect the thermal radiation (infrared rays) emitted from objects and convert it into coloured images, the colours in these images depend on changes in the object's temperature. |

**Give reason .... ?****1 The difference between the concept of heat and the concept of temperature.**

Because heat is energy that transfers from one system to another due to a difference in their temperatures, while temperature indicates the degree of hotness or coldness of an object and is considered as the measure of the average kinetic energy of its particles.



**2 Cooking pans are made of aluminum with wooden handles.**

Because aluminum is a thermal conductor, while wood is a thermal insulator.

**3 Polystyrene panels are placed between bricks during building walls.**

Because polystyrene is a thermal insulator substance that helps to avoid rapid temperature changes inside buildings when temperatures change outside, that leads to reducing air conditioning costs within the buildings.

**4 It is preferred to use hollow clay bricks rather than solid clay bricks during constructing wall.**

Because the thermal conductivity of the air present in the hollow spaces of hollow bricks is approximately 20 times less than that of the clay brick substance.

**5 The use of silver in cooling systems within smartphones.**

To get rid of the heat generated within the internal components, which may lead to reduce performance and may damage them.

**6 The eagle can fly in the air at great heights without flapping its wings, despite the Earth's gravitational force pulls it down.**

Because the warm air convection currents rising from the Earth's surface cause it to rise upwards, which is equal to the gravitational force and keeps the eagle floating in the air.

**7 Heat does not transfer by convection through solid substances.**

Because convection currents transfer through the movement of particles in a substance, and the particles in solid substances do not move from their position.

**8 It is preferred to place the electric space heater on the floor of the room.**

To ensure the distribution of heat throughout the room where heat is transferred from the space heater to the surrounding air, causing the warmer, less dense air to rise to the top while the cooler, denser air moves downwards (to sink).

**9 The occurrence of the sea breeze phenomenon.**

Due to the fact that land heats up more quickly than water during the day, this is due to the lower specific heat of land compared to that of sea water.

**10 The sand on the beach is hotter than the sea water at noon.**

Because the specific heat of the sand is lower than that of water.

**11 The heat of the Sun transfers to us through radiation.**

Because heat transfer by radiation does not require the presence of material particles.

- 12 It is preferred to wear dark coloured clothes in winter and light coloured clothes in summer.**

Because dark coloured clothes absorbs infrared radiation better than light coloured clothes.

- 13 Painting solar heater pipes in black colour.**

To increase its absorption of infrared radiation so the temperature of the water within it rises.

- 14 Firefighters wear shiny silver clothes.**

Because shiny objects reflect infrared rays well.

- 15 Snakes are able to hunt their preys at night.**

Because they receive infrared rays emitted from the bodies of preys through sensory receptors located at the front of their head.

### What happens when .... ?

- 1 A hot metal block is dipped in a beaker of cold water (according to the temperature of both the metal mass and the water).**

The temperature of the metal block decreases while the temperature of the water increases until they reach thermal equilibrium.

- 2 Two non-isolated systems with different temperatures come into contact.**

Heat transfers from the system at a higher temperature to the system at a lower temperature until they reach thermal equilibrium.

- 3 A hot drink at a temperature of  $70^{\circ}\text{C}$  is mixed with another drink at a temperature of  $20^{\circ}\text{C}$**

The temperature of the hot drink decreases while the temperature of the cold drink increases, until their temperatures are equal when thermal equilibrium is reached.

- 4 A metal spoon is placed in a cup of hot tea.**

Heat transfers from the hot tea to the spoon by conduction.

- 5 Heating the end of a metal rod with small pins that are fixed on it with small pieces of wax.**

The pins fall one by one from the closest end to the heating source to the furthest end.

- 6 Polystyrene insulating panels are used between the building walls during construction.**

Thermal insulation increases, preventing the feeling of rapid temperature changes outside the building and reducing the cost of air conditioning inside the building.



## Compare between .... ?

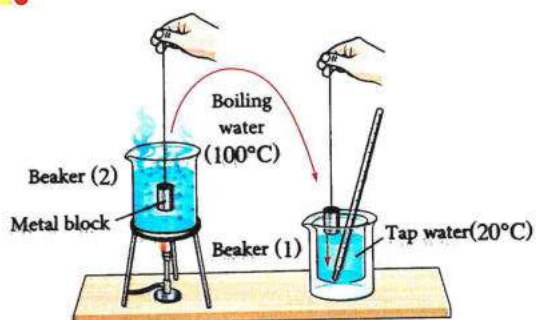
| 1 Thermal conduction                                                                                                                                     | Thermal convection                                                                                       | Thermal radiation                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| The transfer of thermal energy through solid objects from one point to another, without the particles moving from their positions                        | The transfer of thermal energy through fluids with the movement of their particles                       | The transfer of thermal energy from the surfaces of hot objects without the need for material particles |
| Heat transfers from the objects (point) with the highest temperature to the objects (point) with the lowest temperature, till thermal equilibrium occurs | Heat transfers upwards (from the region of least density in the fluid to the region of greatest density) | Heat transfers in all directions                                                                        |
| It takes place as a result of the contact between particles of solids                                                                                    | It takes place as a result of the movement of fluid particles                                            | It takes place without the need for a material medium                                                   |
| It occurs in solid matter only                                                                                                                           | It occurs in liquid and gaseous matter (fluids)                                                          | It occurs in both vacuum (space) and gases                                                              |

| 2 Thermal conductors                                                                                                                                                                                                          | Thermal insulators                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>They are good heat-conducting substances (high thermal conductivity).</p> <p><b>Example :</b></p> <ul style="list-style-type: none"> <li>• Diamond.</li> <li>• Metals in general, such as: aluminum and copper.</li> </ul> | <p>They are poor heat-conducting substances (low thermal conductivity)</p> <p><b>Example :</b></p> <ul style="list-style-type: none"> <li>• Wood.</li> <li>• Plastic.</li> </ul> |

## Study the following figures, then answer .... ?

 In the experiment shown in the opposite figure, if the temperature of the piece of metal before it was placed in the boiling water is  $30^{\circ}\text{C}$ , answer the following:

- (1) In which direction does heat flow in the beaker (2)?
- (2) What happens to the temperature of the water in the beaker (1) after the metal block is transferred from the boiling water to it? Explain your answer.

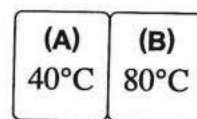


### Answer

- (1) Heat transfers from the boiling water to the metal block.
- (2) The temperature of the tap water rises above  $20^{\circ}\text{C}$  due to the transfer of heat from the metal block.

### From the two opposite figures, mention :

- (1) Possible methods of heat transfer in each of them.
- (2) The direction of heat transfer in Figure (1).



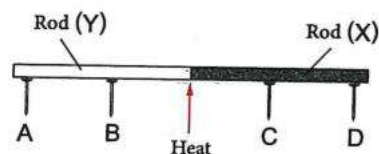
(1)

(2)

### Answer

- (1) \* **Figure (1)** : Heat transfer by conduction.  
\* **Figure (2)** : Heat transfer by convection and radiation.
- (2) Heat transfers from object (B) to object (A).

The opposite figure shows a practical experiment in which four pins were fixed with identical wax pieces on rods (X) and (Y), which are of the same length and thickness :



- (1) What is the purpose of making this experiment?
- (2) What is the scientific explanation for the falling of the pin (C) :
  - 1- Before the pin (B).
  - 2- Before the pin (D).

### Answer

- (1) To show the difference in thermal conductivity of different substance.
- (2) 1- Because the thermal conductivity of rod (X) is greater than the thermal conductivity of rod (Y).  
2- Because point (C) is closer to the heat source than point (D).

### From the opposite figure:

What is the method of heat transfer in each of (1), (2), (3)?

### Answer

- (1) : Conduction.
- (2) : Convection.
- (3) : Radiation.





## Variant Questions .... ?

**Q1** When does the heat transfer stop between two objects in contact, one at a temperature of  $100^{\circ}\text{C}$  and the other at  $60^{\circ}\text{C}$  ?

**A** When their temperatures are equal and they reach thermal equilibrium.

**Q2** Mention the methods by which heat transfers.

**A** Conduction, convection, and radiation.

**Q3** Explain how heat transfers from one end of a copper rod to the other end when it is heated.

**A** Heat transfers as a result of collisions between particles, allowing energy to move from the point of higher temperature to the point of lower temperature along the rod, without the particles themselves moving from their positions.

**Q4** Arrange the following natural elements according to their thermal conductivity:

(Copper - Diamond - Silver)

**A** Diamonds, then silver, then copper.

**Q5** Mention one life application about heat transfer by:

(1) Conduction.                      (2) Convection.                      (3) Radiation.

**A**

- (1) The manufacture of cooking utensils from metals and the production of their handles from plastic or wood.
- (2) The occurrence of the sea breeze phenomenon in summer due to convection currents.
- (3) Firefighters wear shiny silver clothes.

**What is meant by .... ?**

|                          |                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Physical change</b>   | A change in the state or shape of a substance without changing its chemical composition.                                                                          |
| <b>Chemical change</b>   | A change that results in new substances with chemical properties different from those of the original substances.                                                 |
| <b>Chemical reaction</b> | The process of breaking the bonds between atoms of the reacting substances (reactants) and forming new bonds between atoms of the produced substances (products). |

**Give reason .... ?**

- Ice melting is a physical change.**  
Because it is not accompanied by a change in chemical composition.
- Breaking of a bottle filled to the brim with water and tightly closed when placed in the freezer, is not a chemical reaction.**  
Because the expansion of water during freezing does not lead to a change in the chemical composition of water or glass.
- Effervescence occurs when sodium bicarbonate is added to acetic acid.**  
Due to the occurrence of a chemical reaction, accompanied by the evolution of carbon dioxide gas.
- Formation of a white precipitate when silver nitrate solution is added to sodium chloride solution.**  
Due to the occurrence of a chemical reaction that results in the formation of silver chloride, which does not dissolve in water.
- The formation of gas bubbles when dilute hydrochloric acid is added to a strip of magnesium.**  
Due to the occurrence of a chemical reaction, resulting in the evolution of hydrogen gas.
- During burning a strip of magnesium, a protective mask must be used.**  
To avoid the damage from the bright light.
- A strong odour is emitted when sugar is burned.**  
Due to the occurrence of a chemical reaction that results in the formation of caramel.
- Iron goes rusty when it is exposed to oxygen in moist air.**  
Due to the occurrence of a chemical reaction between iron and moist atmospheric oxygen.



## What do you observe when .... ?

- 1 **Baking soda (sodium bicarbonate) is added to vinegar (dilute acetic acid).**

Effervescence occurs with evolution of gas bubbles of carbon dioxide gas.

- 2 **Silver nitrate solution is added to sodium chloride solution.**

A white precipitate of silver chloride is formed, which turns violet when exposed to sunlight.

- 3 **A piece of zinc is added to the copper sulphate solution.**

The blue colour of the copper sulphate solution disappears, and reddish-brown copper is deposited over the zinc plate.

- 4 **Sugar is burnt.**

A solid black substance (carbon) is formed, with smoke and a strong odour.

- 5 **A liquid mixture of oil and caustic soda solution is heated with continuous stirring.**

The liquid consistency changes, and solid soap is formed.

- 6 **An iron nail is exposed to moist air.**

The nail rusts due to its reaction with moist atmospheric oxygen.

- 7 **Slices of apples are left in the air.**

The colour of apple slices turn brown.

## Remember that ....

The following table illustrates examples of the two types of changes that occur in substance :

| Substance changes | Examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical changes  | <ul style="list-style-type: none"><li>• Dissolution of salt in water.</li><li>• Melting of ice.</li><li>• Wood cutting.</li><li>• Water evaporation.</li></ul>                                                                                                                                                                                                                                                                                                                                   |
| Chemical changes  | <ul style="list-style-type: none"><li>• Conversion of milk into yogurt.</li><li>• Rusting of an iron nail.</li><li>• Burning a piece of bread in the oven.</li><li>• Limewater turns milky (turbid) when carbon dioxide gas passes through it.</li><li>• The colour of a damp (wet with water) universal indicator strip is changed when it is brought close to ammonia gas.</li><li>• Frying eggs.</li><li>• Food spoiling outside the refrigerator.</li><li>• Ignition of fireworks.</li></ul> |

**How can you deduce the occurrence of the chemical reaction be indicated when .... ?**

**1 Baking soda is added to sulphuric acid.**

The occurrence of effervescence with evolution of gas bubbles of carbon dioxide gas.

---

**2 Silver nitrate solution is added to sodium chloride solution.**

Formation of a white precipitate of silver chloride, which turns violet when exposed to sunlight.

---

**3 Zinc plate is placed in a copper sulphate solution.**

The blue colour of the copper sulphate solution disappears, and reddish-brown copper is deposited over the zinc plate.

---

**4 Dilute hydrochloric acid is added to a strip of magnesium.**

Formation of gas bubbles of hydrogen gas.

---

**5 A strip of magnesium is heated in the air.**

The strip glows with a bright light accompanied by heat emission, and converts into a white powder.

---

**6 Sugar is burned.**

It turns black with the evolution of smoke and a strong odour (caramel smell).

---

**7 Oil reacts with caustic soda.**

The liquid mixture turns into solid soap.

---

**8 Eggs are fried.**

The colour and texture of the white part (egg whites) and yellow part (egg yolk) of eggs change.

---

**9 Iron is exposed to moist atmospheric oxygen.**

The iron rusts and changes its colour.

---

**10 An apple is cut into slices and left it in the air.**

Its colour turns to brown.

---

**11 Fireworks are lit.**

Emission of light and heat.

---



## Variant Questions .... ?

**Q1** When a zinc plate is placed in blue copper sulphate solution, and observed that the colour of the solution was disappeared and a precipitate is formed :

- (1) What is the name of the formed precipitate?
- (2) How to explain the disappearance of the colour of the solution?

**A** (1) Copper.

(2) Due to the formation of the colourless zinc sulphate solution.

**Q2** Apply the concept of chemical reaction to the reaction between nitrogen gas  $N_2$  and hydrogen gas  $H_2$  to form ammonia gas  $NH_3$

**A** The breaking of bonds between the atoms of the molecules of each of  $N_2$ ,  $H_2$  (the reactants) and the formation of new bonds between the atoms of the molecules of  $NH_3$  (the product).

**Q3** Mention some indications of the occurrence of the chemical reaction "only four are required".

- |            |                             |   |                                        |
|------------|-----------------------------|---|----------------------------------------|
| <b>A</b> * | Formation of precipitate.   | * | Change in the colour of the substance. |
| *          | Emission of odour.          | * | Evolution of gas.                      |
| *          | Emission of light and heat. | * | Change in consistency.                 |

**Q4** Solution (A) was added to sodium chloride solution, so a white precipitate is formed:

- (1) What is solution (A) ?
- (2) What is the change in the colour of the precipitate when exposed to sunlight?

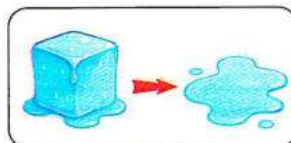
**A** (1) Silver nitrate solution.

(2) The colour of the precipitate turns violet.

## Study the following figures, then answer .... ?

 From the two opposite figures:

- (1) Which of them represents a chemical change? Giving reasons.
- (2) In which of them there is no change in the chemical composition of the substance?



(1)



(2)

### Answer

(1) Figure (2) due to the formation of new substance which differs in their properties from the properties of wood.

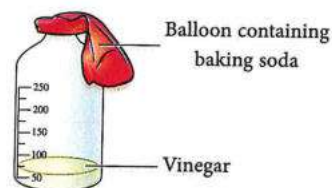
(2) The state expressed in figure (1).

### From the opposite figure:

(1) What do you observe when you lift the balloon to pour baking soda into the bottle?

(2) What do you conclude from this activity?

(3) What is the scientific name of each of the two reactants?



### Answer

(1) The evolution of gas bubbles and evolving gas causes the balloon to inflate.

(2) A chemical reaction occurs between baking soda and vinegar.

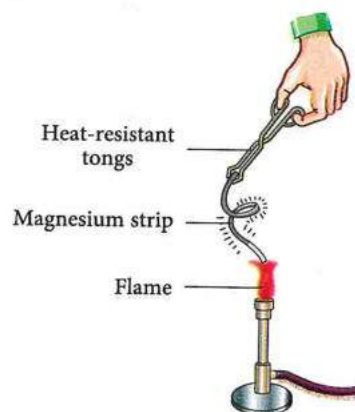
(3) **Baking soda:** sodium bicarbonate, **vinegar:** dilute acetic acid.

### From the opposite figure:

(1) What do you observe? with explanation.

(2) What is the importance of the heat-resistant tongs in the figure?

(3) Identify another safety precaution that should be considered after the end of the reaction, with an explanation of the reason.



### Answer

(1) The magnesium strip glows with a bright light accompanied by heat emission, due to a chemical reaction.

(2) To avoid burns during its combustion.

(3) Do not touch the formed white powder immediately after the reaction, as it will be very hot.



# كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9



حمل الآن

مجاناً وحصرياً

# المراجعة رقم (2)

اختبار شهر نوفمبر





## Lesson ( 4 )

### Methods of heat transfer

#### Heat

- Energy that is transferred from one system to another or to the surrounding, due to a difference in temperature.

#### Notes:-

- Heat flow means the movement of thermal energy from a hot object to cold one .
- **Give reason:** A pot of boiling water (  $100^{\circ}\text{C}$  ) in a room (  $25^{\circ}\text{C}$  ) the water cools down ?  
Because heat moves from the hot water to cooler room.

#### ❖ Practical Activity ( How heat flows ? )

| Steps                                                                               | Observations                                                                                   |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| 1-Measure the temperature of cold water ( $20^{\circ}\text{C}$ )                    | Water temperature increases<br>$20^{\circ}\text{C} \longrightarrow 28^{\circ}\text{C}$         |
| 2-Heat some metal balls in boiling water until they reach ( $100^{\circ}\text{C}$ ) | Metal balls temperature decreases:<br>$100^{\circ}\text{C} \longrightarrow 28^{\circ}\text{C}$ |
| 3-Put the hot balls into the cold water and measure the new temperature             | Final temperature ( equilibrium ) = $28^{\circ}\text{C}$                                       |

#### Notes :

- Water heats up slowly.
- Metal balls cool down quickly.
- **Reason:** the specific heat of water is greater than the specific heat of metal.

#### ❖ Thermal Equilibrium :-

- When two objects at different temperatures come into contact:
  - Heat flows from the hot object to the cold object.
  - Flow continues until both reach the same temperature.

## Thermal Equilibrium

- Is the state when two systems in contact reach to the same temperature.

### ➤ Important :

- Heat lost by the hot body = heat gained by the cold body

### ➤ Examples :

- 1-Object ( 50 °C + object ( 30 °C) —————> both reach ( 40°C)
- 2- Object ( 30 °C)+ Object ( 30 °C)—————> No heat transfer .
- 3-Cup of Nescafe ( 70°C) + Milk ( 20 °C)—————> The final temperature is between 70 °C and 20 °C

### + Notes :-

- Heat transfer stops when thermal equilibrium is reached.
- The rate of change depends on the specific heat capacity of the material, differ in mass and type.

### Don't forget

#### Specific heat capacity:

The amount of heat energy required to raise the temperature of (1 Kg) of a substance by 1°C

- This means that each material has a different ability to retain or absorb heat . this ability called specific heat capacity .





# Methods of heat transfer

Conduction

Convection

Radiation

## ❖ First : Heat transfers by conduction :-

### Conduction

- Heat is transferred through **solids** from the hot side to the cold side.

### ➤ How it works :

Metal rod is **heated**

The particles ( atoms ) **gain kinetic energy**

Particles **vibrate faster** and collide with neighbors particles

These neighbors **gain energy** and pass it on to the next ones

Heat moves without particles leaving their position.

### Thermal conductivity

- A measure of the extent to which a material conducts heat trough it.**

### ➤ Classification of materials :

| P.O.C      | Thermally conductive materials                                       | Thermally insulating material                                       |
|------------|----------------------------------------------------------------------|---------------------------------------------------------------------|
| Definition | <b>Good</b> thermal conductors have <b>high</b> thermal conductivity | <b>Poor</b> thermal conductors have <b>low thermal</b> conductivity |
| Examples   | <b>Diamonds – All Metals</b>                                         | <b>Wood – plastic- cardboard</b>                                    |



### ✓ What happen if :

#### ✓ Two rods ( copper and iron ) with wax and pins are heated ?

Pins on copper fall faster, because copper conducts heat better than iron

### ✓ Give reason:

#### ✓ 1-Pizza is placed in cardboard boxes.

To keep it hot, because cardboard is a heat-insulating material.

#### 2-The presence of cooling systems inside electronic devices such as computers and smartphones that use materials that conduct heat well such as silver ?

To get rid of heat generated in the internal components, which may lead to poor performance and possibly damage.

### ❖ Second : Heat transfer by convection :-

#### Convection

- It is the transfer of heat in liquids and gases by the movement of their particles.

#### How it works (in water)?

1. When water near the bottom is heated, particles gain energy.

↓  
move faster

↓  
become less dense.

2. Hot water rises up.

3. Cold water (more dense) moves down to take its place.

4. This continuous movement forms convection currents.



## How it works (in air)

- 1-When air is **heated**, its density **decreases** → **rises** ( moves up ) .
- 2-When air is **cooled**, its density **increases** → **sinks** ( moves down ) .

### Examples

1. **Heater at floor of room:** Warm air rises, cold air sinks.
2. **Freezer at top of refrigerator:** Cold air sinks, warm air rises.
3. **Sea Breeze:**
  - During the day, land heats faster than sea.
  - Warm air above land rises, replaced by cold air from sea.



### Sea Breeze

The movement of cold air ( breeze ) from the sea during the day towards the land.

### ✓ Give reason:

**The reason for sea Breeze occurrence.**

The specific heat of land is lower than the specific heat of sea water.

### ✚ Note :

- The effect of the sea Breeze phenomenon is **more** evident in the **summer** than in the **spring or autumn**



### How can an eagle fly in the air at great heights?

The air near the Earth's surface is heated by the sun.



The warm air becomes lighter (less dense) and rises upwards.

The eagle spreads its wide wings to rise with the warm air currents without flapping its wings.

The upward force of warm air balances the force of gravity,  
So the eagle can stay high in the sky easily

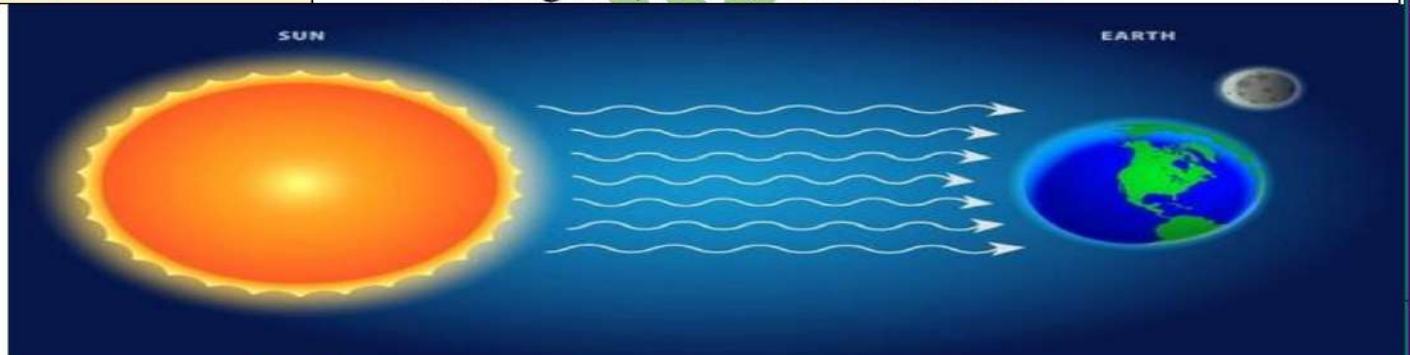
### ☀ Third : Heat Transfer by Radiation:-

#### Radiation

- It is the transfer of heat energy in the form of electromagnetic waves (such as light and infrared) **without the need of particles or a medium.**
- Heat is transmitted by radiation in a **vacuum** and in **gases**

#### Electromagnetic waves

- Waves that propagate in a vacuum at a very high speed, reaching 300,000 m/s **in all directions**



#### ✚ Notes :-

- Heat from the sun reaches Earth by **radiation through space.**
- **All hot objects radiate heat (infrared rays).**
- **The hotter the object, the more infrared radiation it emits.**
- **Solar radiation consists of many electromagnetic waves.**







### Examples & Applications:

1. Heat transfer from a lamp to the hand.
2. Solar water heaters are painted black to absorb radiation.
3. Clothes:

| In the Summer                                   | In the Winter                         |
|-------------------------------------------------|---------------------------------------|
| Wear white / light clothes (reflect radiation). | Wear dark clothes (absorb radiation). |

4. Firefighters wear shiny uniforms to reflect heat.

|                          |                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Thermal radiation</b> | <ul style="list-style-type: none"> <li>The transmission of infrared rays from the surfaces of objects, especially hot ones, without the need for material particles.</li> </ul> |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                     |                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Thermography</b> | <ul style="list-style-type: none"> <li>A technology using special cameras to detect thermal radiation and convert it into colored images.</li> </ul> <p>➤ The thermograph camera is used :</p> <ol style="list-style-type: none"> <li>1-Photography in dark.</li> <li>2- Detecting body temperature</li> </ol>  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### □ Biology Integration

✓ Snakes can hunt prey at night ? ( G.R )

Because sensors in their heads detect infrared radiation from warm bodies.



## Worksheet ( 4 )

### Q.1) Write the scientific term :-

- 1) The energy that transfer from one system to another as a result of the difference in their temperature. (.....)
- 2) The state in which 2 different systems differ in their temperature and touching each other where their temperature becomes equals. (.....)
- 3) A Technique in which a camera use the sense of thermal waves emitted from bodies and change it into colored photos. (.....)

### Q.2) What is meant by:

(1) Heat:

.....

(2) Thermal equilibrium

.....

(3) Sea breeze

.....

.

### Q.3) Give reason :-

1-It is preferable to place an electric heater on the floor of a room.

.....

2- The sun's heat is transmitted to us by radiation.

.....

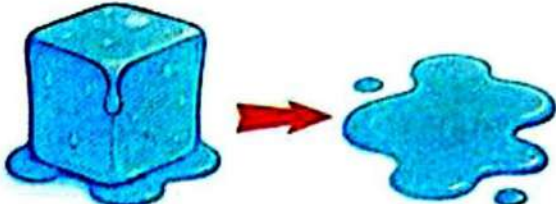




## UNIT (2)



### Lesson (1): Chemical Reactions

| Physical Changes                                                                                                                                                                                                                                                                                                                                                                    | Chemical Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>It is a change in the state or shape of matter without changing its chemical composition.</p> <ul style="list-style-type: none"> <li>- Melting of ice</li> <li>- Dissolving sugar in water</li> <li>- Dissolving salt in water</li> <li>- Melting of wax.</li> <li>- Cutting paper</li> </ul>  | <p>It is the change that results in new substances with different chemical properties from the original materials.</p> <ul style="list-style-type: none"> <li>- Burning of wood</li> <li>- Rusting of an iron nail.</li> <li>- Milk turning into yogurt</li> <li>- Burning of wax.</li> <li>- Burning a piece of bread in the oven.</li> <li>- Clouding of clear limewater when carbon dioxide gas is passed through it</li> </ul>  |

#### Give reason:

-Clouding of clear limewater when carbon dioxide gas is passed through it is considered chemical change.

→ Due to the chemical reaction and the formation of a new substance that insoluble in water .

- Change in the color of a moistened universal indicator strip when exposed to ammonia gas is considered chemical reaction.

→ Due to the chemical reaction and the formation of a new substance that has different color.



## CONCEPT OF CHEMICAL REACTIONS :

### Activity (1) :

#### Materials and Tools Used:

Baking soda (sodium bicarbonate) - Vinegar (diluted acetic acid) – Balloon - Funnel - Empty bottle

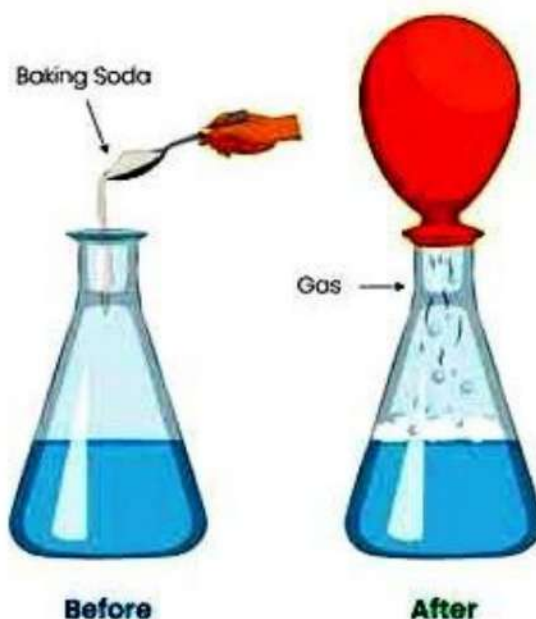


| Steps                                                        | Observation                                                                                       | Explanation                                                                                                                                                             |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1- Put two spoons of baking soda into the balloon.           | <b>Effervescence occurs and gas bubbles rise, causing the balloon to expand and fill with gas</b> | <b>The chemical reaction between baking soda (sodium bicarbonate) and vinegar (diluted acetic acid) results in effervescence and the release of carbon dioxide gas.</b> |
| 2- Pour some vinegar into the bottle.                        |                                                                                                   |                                                                                                                                                                         |
| 3- Insert the balloon's mouth into the bottle's mouth.       |                                                                                                   |                                                                                                                                                                         |
| 4- Lift the balloon to pour the baking soda into the bottle. |                                                                                                   |                                                                                                                                                                         |

*Without Baking Soda*



*With Baking Soda*





## Mechanism of chemical reactions

### ➤ Chemical Reaction

**A process that involves the transformation of:**



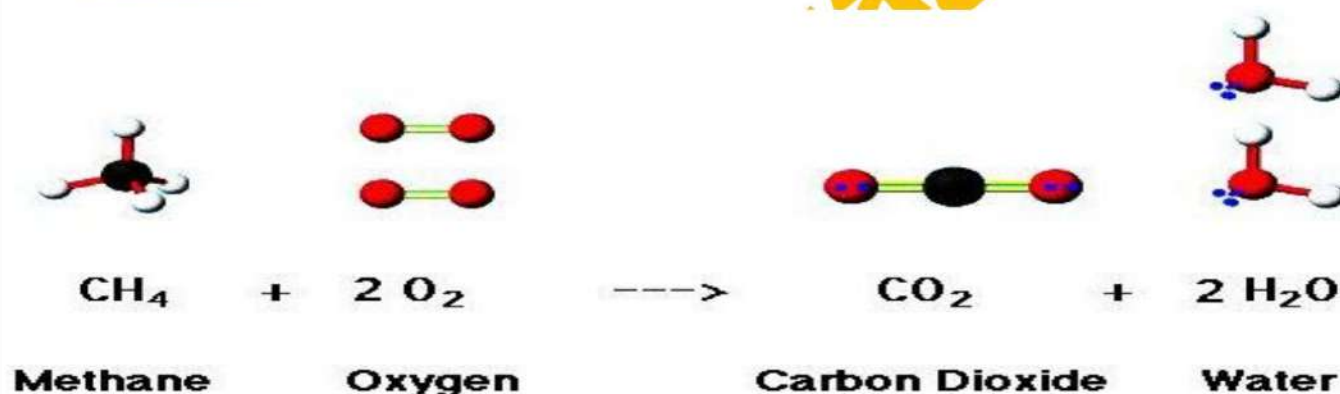
**In a chemical reaction, the reactants combine, decompose or are replaced by new reactants to form new products.**

#### **Step 1:**

Breaking the bonds between atoms in the molecules of the reactants.

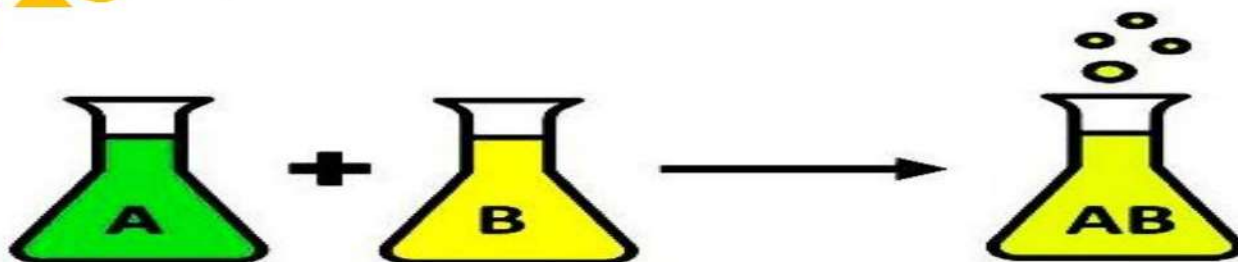
#### **Step 2:**

Rearranging the atoms and forming new bonds to create the products.



#### Combustion Reaction

➤ **Chemical reaction:-** It is the process of breaking the bonds between atoms in the molecules of the reactants and formation of new bonds between atoms in the molecules of the products.





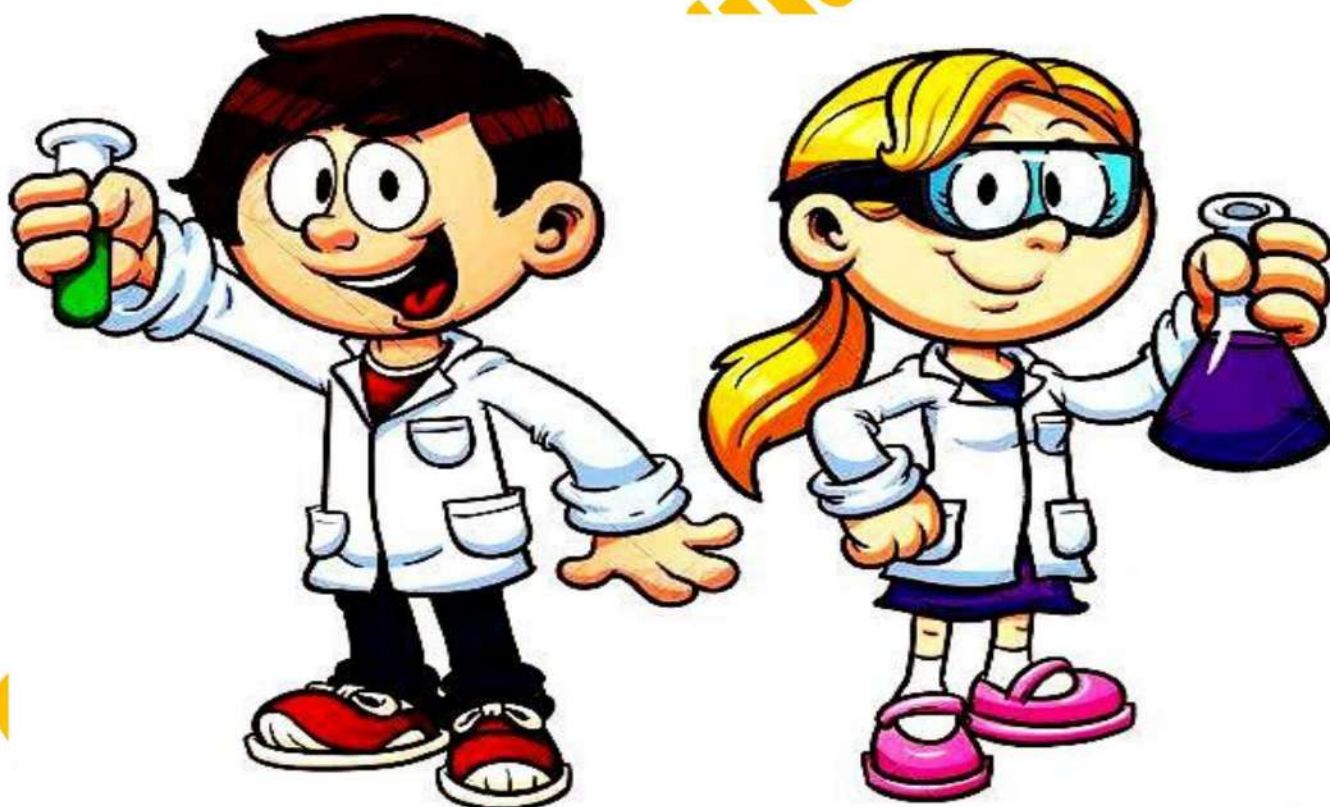
indicators of the occurrence of a chemical reaction

Formation of a precipitate

Colour change

Evolution of gas

Emission of light and heat





| Indicators                                | Chemical Reaction                                                                                                                                                                     | Evidence of chemical reaction                                                                                                                                                                                                                   |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1-Formation of a precipitate</b>       | Adding silver nitrate solution ( $\text{AgNO}_3$ ) to sodium chloride solution ( $\text{NaCl}$ )<br> | A white precipitate of silver chloride ( $\text{AgCl}$ ) forms, which is insoluble in water and settles at the bottom of the container.<br>                  |
| <b>2. Gas Evolution</b>                   | Adding diluted hydrochloric acid ( $\text{HCl}$ ) to a strip of magnesium ( $\text{Mg}$ )<br>        | Bubbles of hydrogen gas are formed<br>                                                                                                                       |
| <b>3.Change in color of the substance</b> | Placing a zinc plate ( $\text{Zn}$ ) in copper (II) sulfate solution ( $\text{CuSO}_4$ )<br>        | → The blue color of the copper sulphate solution disappears, forming a colorless zinc sulphate solution, and red copper precipitates on the zinc plate.<br> |
| <b>4.Emission of light and heat</b>       | Burn a strip of magnesium ( $\text{Mg}$ ) in atmospheric air<br>                                   | $\text{Mg}$ strip turns into magnesium oxide ( $\text{MgO}$ ) white powder, which is soluble in water.<br>                                                 |

➤ What indicates a chemical reaction when baking soda reacts with a diluted acid like  $\text{H}_2\text{SO}_4$  ?

➡ Emission of carbon dioxide gas bubbles





- What indicates a chemical reaction when sodium hydroxide (NaOH) solution reacts with copper chloride ( $\text{CuCl}_2$ ) solution?

→ A blue precipitate of copper hydroxide is formed that is insoluble in water.



- What indicates a chemical reaction when an orange goes rotten ?

→ The color changes to dark greenish and a bad smell is released.



- How can you distinguish between copper sulfate and ferrous sulphate when adding sodium hydroxide separately?

→ Precipitate difference: a blue precipitate of copper hydroxide and a green precipitate of iron (II) hydroxide are formed.

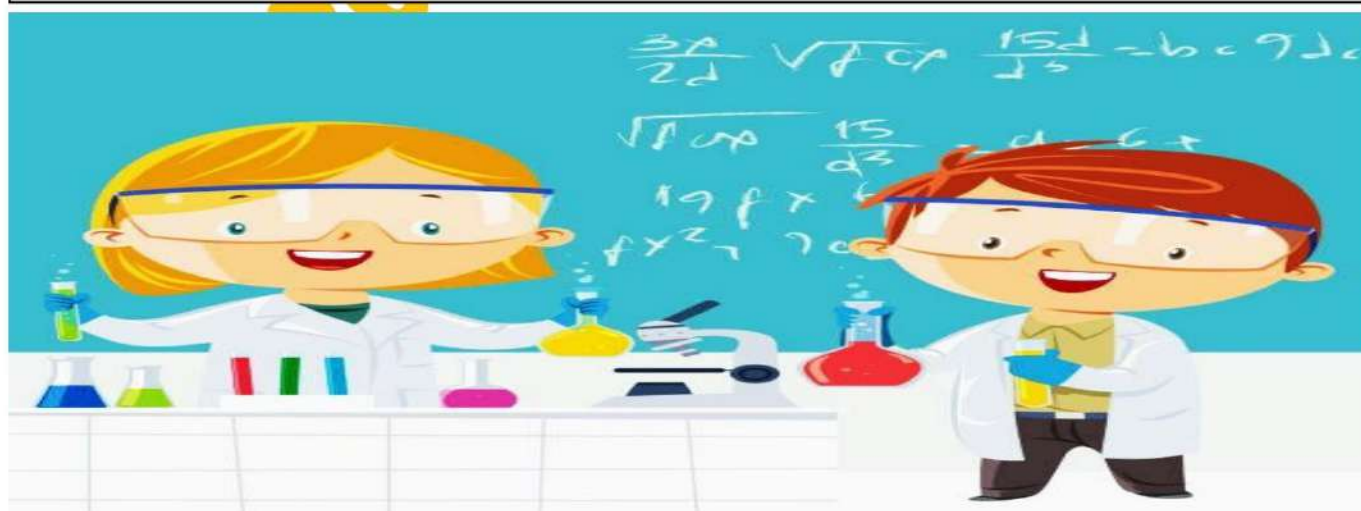


**Do the following change indicate a chemical reaction? How can this be**

- A glass bottle filled to the brim with water and tightly closed is broken when placed in the freezer of the fridge.



No, because the expansion of water during freezing does not result in a change in the chemical composition of the water or the glass.





**NOTE:** When a reaction occurs , it leads to the formation of :  
precipitate, a change in color, the release of a gas, the emission of light and heat, the extinguishing of a burning match stick, or the increase in the glow of a burning splinter.

**Laboratory safety precautions :**

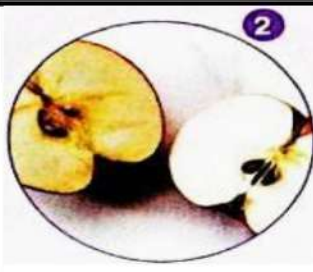
1. Wearing a protective mask.  
→ To avoid the harmful effect of bright light.
2. Do not touch the white powder formed after burning magnesium ribbon.  
→ Because it will be hot.
3. Hold the magnesium strip with heat-resistant tongs.  
→ To avoid burns during burning.
4. Handle acids carefully with extreme caution,, especially concentrated acids.  
→ Because they are very dangerous.

**Chemical reaction in life**

**1- When eggs are fried, a chemical reaction occurs, causing a change in the colour and texture of both white and yellow parts.**



**2. Reaction of oxygen in the air with apple slices causing the apple to turn brown.**



**3. Rusting of Iron when exposed to oxygen in moist air.**



**4. Fireworks reaction causes the emission of light and heat.**



**Evidence of a chemical reaction**





## The Properties of substances before and after chemical

### ➤ ACTIVITY 1: BURNING SUGAR

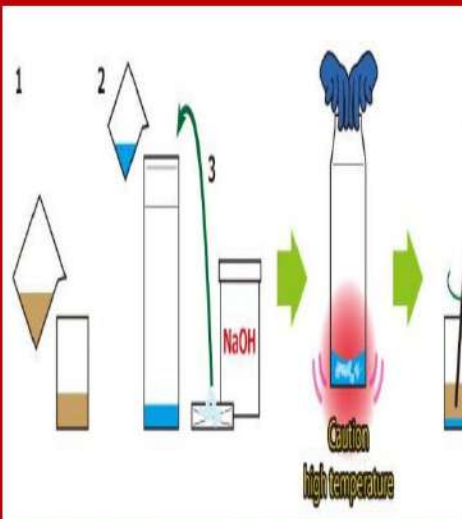
| Steps                                                         | Observation                                                    | conclusion                                                                                                                                                |
|---------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Put a quantity of table sugar in a spoon.                  | -The sugar turns into a brown molten color and begins to burn. | <b>When molten sugar burns, a chemical reaction occurs, indicated by:</b>                                                                                 |
| 2. Slowly heat the sugar by placing the spoon over the flame. | -A strong odor similar to (the smell of caramel) appears       | -The appearance of a strong odor (the smell of caramel) -<br>The color changes<br>-The smoke rises<br>-The formation of a new substance ( <u>carbon</u> ) |

|              | Properties of substances before the reaction                                                             | Properties of substances after the reaction                                                              |
|--------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Color</b> | -White<br>- solid<br> | Black substance<br> |
| <b>Odor</b>  | -Odorless                                                                                                | -Strong odor and smoke                                                                                   |



## ACTIVITY (2) : THE REACTION OF OIL WITH CAUSTIC SODA

**Tools:** Oil - Glass beaker - Caustic soda solution (sodium hydroxide) - Flame - Stirring rod

| Steps                                                                                                                                                                                                                                                                                                                                                                 | Observation                                                                                                                                                            | Conclusion                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1-Place 100 ml of vegetable oil in a glass beaker with a capacity of 250 ml.</p> <p>2-Add 30 ml of caustic soda solution (sodium hydroxide) to the oil drop by drop.</p> <p>3-Heat the mixture using a suitable heat source of 40-50 C while stirring the ingredients well together in one direction.</p> <p>4-Observe the changes that occur and record them.</p> | <p>- The consistency of the mixture change.</p> <p>- A new substance is Formed</p>  | <p>Adding oil to the caustic soda solution while heating leads to a chemical reaction, indicated by a change in consistency and a new substance (soap) is formed.</p>  |

The texture of the substance changes before and after the reaction, as shown in the following table.

|       | <u>Properties of substances before the</u>            | <u>Properties of substances</u> |
|-------|-------------------------------------------------------|---------------------------------|
|       | <u>..</u>                                             | <u>after the reaction</u>       |
| State | Oil: Liquid<br>Concentrated sodium hydroxide solution | Soap: Solid                     |

## WORKSHEET (1)



**Give reason :**

1-Melting ice is considered a physical change.

.....

.....

2-Burning wood is considered a chemical change.

.....

.....

3- Adding drops of food coloring to a glass of water not considered a chemical reaction, even though the water changes color

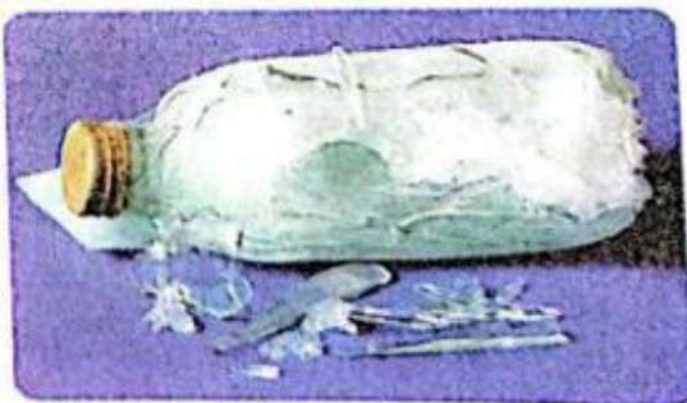
.....

.....

➤ Do the following changes indicate a chemical reaction? Why?

.....

.....





حمل الآن

مجاناً وحصرياً

# المراجعة رقم (3)

اختبار شهر نوفمبر



## Heat Transfer Methods

### Heat Transfer

When you place a cup of hot tea at  $70^{\circ}\text{C}$  in a cold room at  $25^{\circ}\text{C}$ , the tea cools down after a short period of time.

Heat is transferred from the higher-temperature object (the hot tea) to the lower-temperature object (the cold air in the room).



To learn how heat is transferred, conduct the following experiment:

**Activity:** Demonstrates how heat is transferred

**Tools:** 2 glasses - Tap water - Thermometer - Metal block suspended from a string - Heat source (such as a stove)

#### Steps:

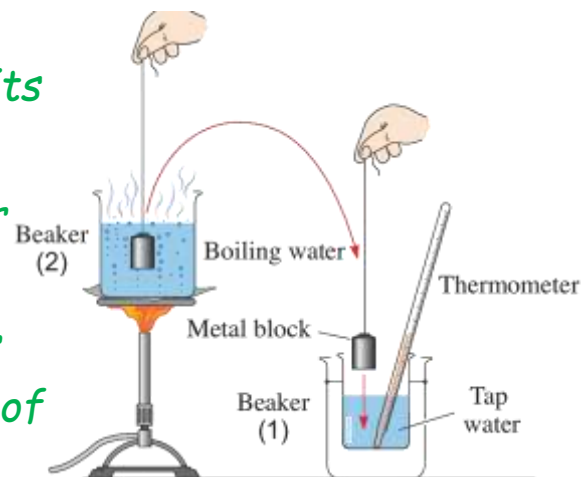
Put tap water in beaker No. (1) and measure its temperature with a thermometer.

Heat another quantity of tap water in beaker No. (2) until it boils.

Immerse the metal block in the boiling water in beaker No. (2), then predict the direction of heat flow.

Move the metal block from the boiling water in beaker No. (2) to the cold water in beaker No. (1), then predict the direction of heat flow. Re-measure the temperature of the water in beaker No. (1) after placing the metal block in it. **What do you notice?**

Heat is transferred from the boiling water in the cup (2) to the metal block.





Heat is transferred from the metal block to the cold water in the cup (1).

The temperature of the tap water in the cup (1) rises after the metal piece is placed inside.

The temperature of the metal piece decreases after it is placed in the tap water.

## Conclusion



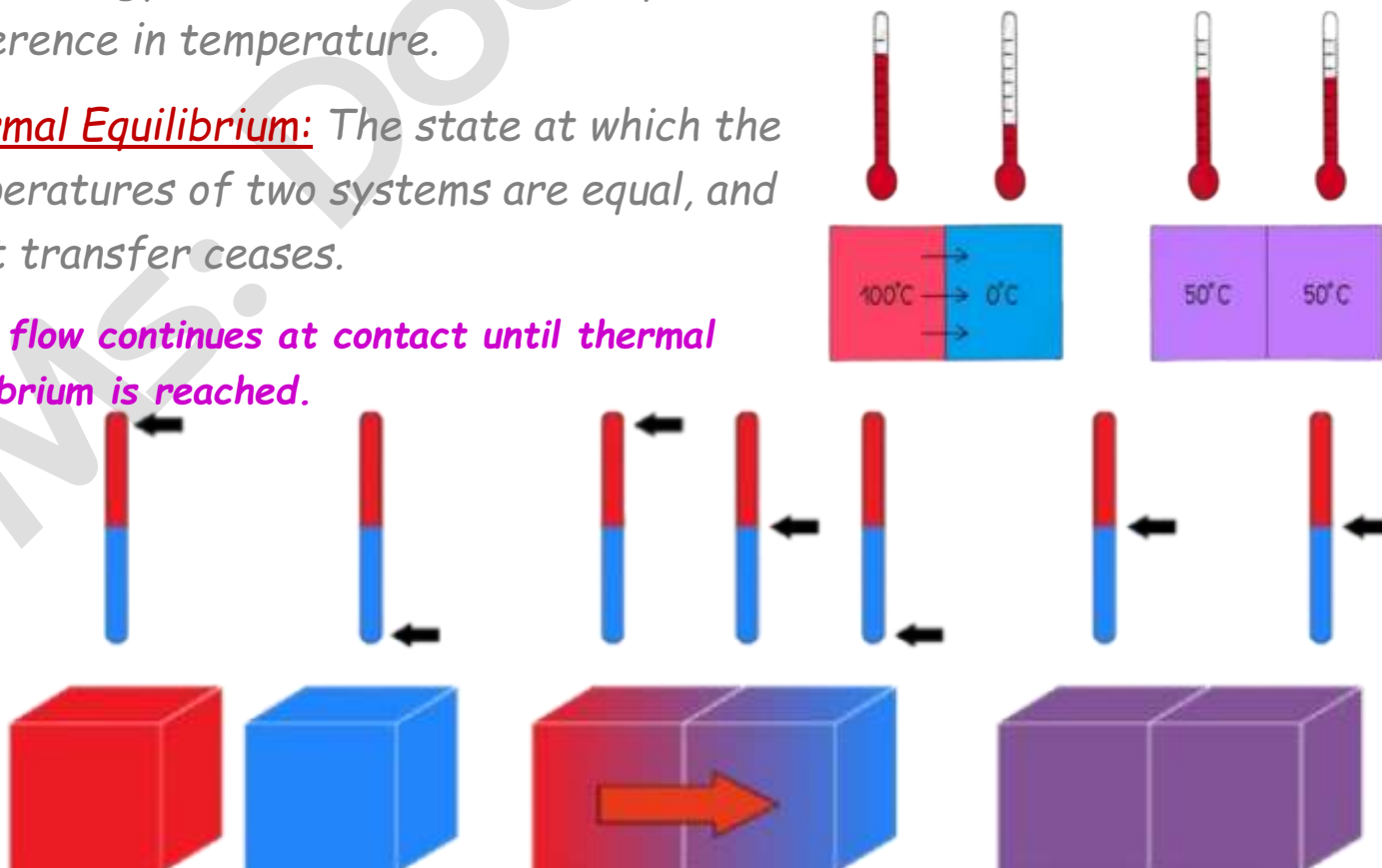
When two non-isolated systems with different temperatures (such as a metal block and water) come into contact, energy is transferred from the **higher-temperature system** to the **lower-temperature system**. Heat transfer continues between them until the temperatures of the two systems are equal.

The energy transferred from one system to another due to a difference in temperature is called **heat**.

**Heat:** Energy transferred from one system to another due to a difference in temperature.

**Thermal Equilibrium:** The state at which the temperatures of two systems are equal, and heat transfer ceases.

Heat flow continues at contact until thermal equilibrium is reached.



*What happens when...?*

*Two bodies with the same temperature come into contact.*

Heat does not flow between them.

*Two bodies with different temperatures come into contact.*

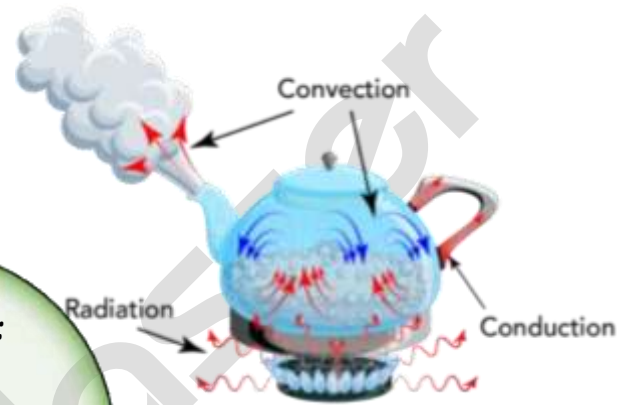
Heat flows from the higher temperature body to the lower temperature body.

## Heat transfer methods

**Conduction:**  
occurs  
through  
some solids.

**Convection:**  
occurs  
through  
liquid and gas  
media.

**Radiation:**  
occurs  
through both  
material and  
non-material  
media.



## Conduction

Heat is transferred through some solid bodies along the body from one point to another, or from a higher temperature body to a lower temperature body. This method is known as **thermal conduction**.

**Heat transfer by conduction** The transfer of heat through some solids from a higher temperature end to a lower temperature end.

**Example:** When we put three spoons of different materials (metal, wood, and plastic) in a cup of boiling water for a minute, and then touch the tip of each spoon, we feel the heat of the metal spoon and we do not feel the heat of the wooden or plastic spoon, as a result of their difference in **thermal conductivity**.





## Thermal conductivity

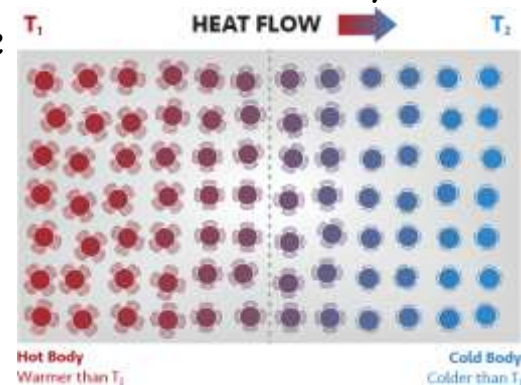
A measure of how well a material conducts heat.

Materials vary in their thermal conductivity and are classified into two types:

| Good Thermal Conductors                                                 | Poor Thermal Conductors                                                     |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Materials with high thermal conductivity are called thermal conductors. | Materials with very low thermal conductivity are called thermal insulators. |
| Such as: metals (iron, copper, aluminum).                               | Such as: wood, plastic, glass, cork.                                        |

## Explanation of heat transfer by conduction:

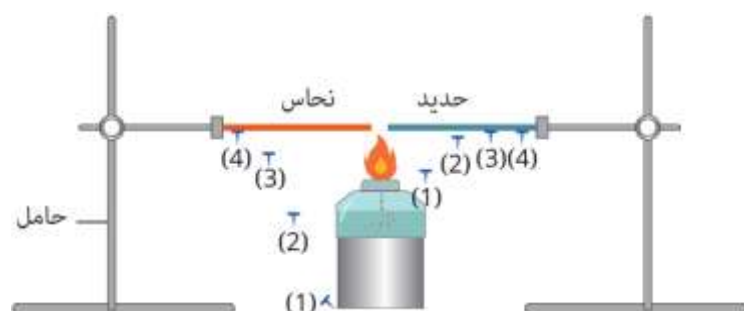
- 1- When the tip of a metal rod is heated, the kinetic energy of the particles within it increases, causing them to vibrate more.
- 2- Some of the energy of these particles is transferred when they collide with neighboring particles, increasing the kinetic energy of the neighboring particles.
- 3- In the same way, some of the energy is transferred to the next particles without the particles themselves shifting their positions.



Metals vary in their degree of thermal conductivity, as in the following experiment:

An activity that demonstrates the differences in the thermal conductivity of metals.

Tools: Two iron and copper rods of the same dimensions - office pins - two easels - candles - a heat source - a stopwatch.



## Steps:

- Hang both legs horizontally on the brackets.
- Use wax to secure pins to each leg at equal intervals.
- Place a heat source under each end of the legs.
- Record the time each pin falls in seconds from the moment the flame is lit.

Note: Staples attached to a copper shank fall out **faster than** those attached to an iron shank.

Conclusion: Metals vary in their thermal conductivity, with copper conducting heat **faster than** iron.

## Integration with Mineralogy

Natural elements vary in thermal conductivity, with:

**Diamond** ranks first in thermal conductivity among natural elements, followed by **silver**, then **copper**.



## Life Applications

### 1. Cookware:

Cookware is made from metal due to its high thermal conductivity. Cookware handles are made from plastic or wood due to its low thermal conductivity.



### 2. Insulating Building Walls:

It is preferable to use thermal insulating materials, such as polystyrene panels between hollow bricks when constructing building walls.

This avoids rapid changes in temperature inside buildings when compared to outside temperatures, thus reducing the cost of air conditioning.



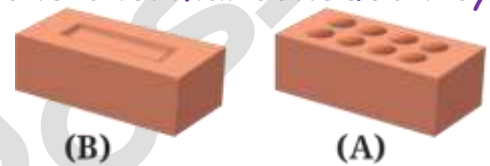


## 3. Cooling Electronic Devices

Electronic devices, such as computers and smartphones, contain cooling systems that use materials that conduct heat well, such as silver, to dissipate the heat generated in internal components, which could lead to poor performance and damage.



**Example:** Imagine you're an engineer. Which of the two types of clay bricks shown in the figure below would you prefer to use in building the exterior walls of a building? Given that the thermal conductivity of clay is approximately 20 times higher than that of air, please explain.



The hollow bricks in Figure (A) are used because the air within the voids in hollow bricks is a poor conductor of heat (a good thermal insulator).

Learn more about the economic and environmental impacts of thermal insulation for buildings.

**Economic impacts of thermal insulation for buildings.**

- Helps save energy consumption.
- Reduces maintenance costs and extends the life of equipment.
- Increases the building's real estate value.

**Environmental impacts of thermal insulation for buildings.**

- Contributes to reducing greenhouse gas emissions.
- Conserves natural resources.

## Heat Transfer by Convection

Any object floating in the air needs something to support it and counteract the force of gravity pulling it downward.



An eagle remains in the air at great heights without flapping its wings thanks to the warm air currents rising from the Earth's surface, known as convection currents.

To understand how heat transfer occurs by convection, let's conduct the following experiment.

**Tools:** Water - Potassium permanganate - Beaker - Flame.

**Steps:**

- Place a beaker containing water over a flame.
- Drop a purple crystal of potassium permanganate into the beaker.
- Record your observations during the heating process.



**Note:** The spread of the purple color of potassium permanganate in water from the bottom to the top.

**Explanation:** When the water at the bottom of the cup is heated, the water molecules gain thermal energy, moving faster and further apart. This reduces their density and causes them to rise, while the cooler (denser) water sinks to replace them.

The constant movement of the water molecules causes heat to be transferred and distributed throughout the liquid in the form of convection currents, resulting in the purple color spreading up and down in a continuous cycle.

**Conclusion:** Heat is transferred through liquids and gases by the movement of molecules through convection.



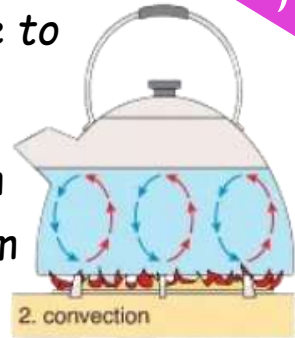
## Convection Currents

The vertical movement of particles in liquids and gases due to differences in temperature and density of the medium.

Heat is transferred through liquid and gaseous media from bottom to top by the ascent of hot particles of the medium and the descent of cold particles of the medium.

This method is known as **convection heat transfer**.

**Convection Heat Transfer:** Heat is transferred through liquid and gaseous media by the ascent of hot particles of the medium (the less dense ones) and the descent of cold particles of the medium (the denser ones) downward.



### In Real-Life Applications

#### 1. Placing a heater on the floor of a room:

Heat is transferred from the heater to the air next to it. The warm air rises upward, and the cold air below descends to replace the warm air. This distributes heat throughout the room and warms it.



**The heater is placed on the floor of the room.**

**Heats the air nearby, making it less dense and rising, replaced by denser, cooler air. This continues until all the air in the room is warmed.**

**2. Sea breeze:** A sea breeze is a natural phenomenon that occurs when the land temperature rises **faster than** the water temperature during the day.

It's the movement of cold air from the sea to the land during the day is due to the temperature difference.



The effect of the sea breeze is more pronounced in the summer than in the spring or fall.

## Explanation of the Sea Breeze

1- The air in contact with land heats up more than the air above the water's surface when sunlight strikes it.

Because the specific heat of land is lower than the specific heat of water.

2- The density of the air in contact with land decreases and it rises.

3- It is replaced by cooler air from the sea, forming a sea breeze.

## **Radiation**

Heat is transferred by conduction and convection via particles of matter.

In radiation, heat can be transferred through a vacuum and does not require a physical medium.

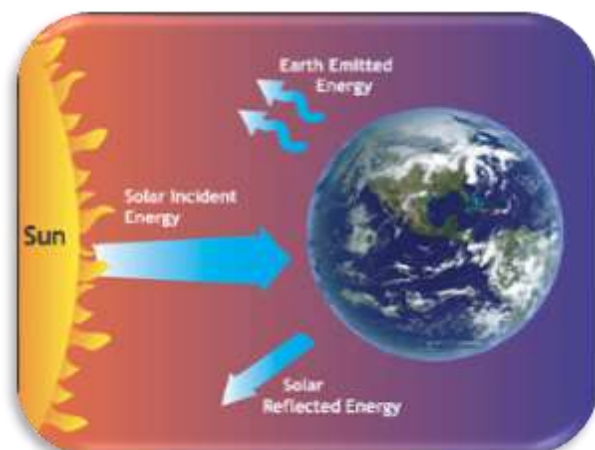
**Example:** Heat is transferred from the sun to the Earth's surface, even though there are millions of kilometers of space between them.

**Radiation Heat Transfer:** A method by which heat is transferred through a vacuum without the need for a physical medium.

Heat is transferred by radiation through both **physical and non-physical media**.

## Solar Radiation

Solar radiation consists of many **electromagnetic waves** that propagate through space at a very high speed, reaching **300,000 Km/s** in all directions.





Electromagnetic waves are divided into:

- Visible waves, *such as light.*
- Invisible waves, *such as infrared radiation, which has a thermal effect. When materials absorb infrared radiation, their temperature rises, which is why you feel warm when exposed to solar radiation.*

Hot objects are a source of infrared radiation.

*Opaque (dark) objects absorb infrared radiation better than bright objects; therefore:*

*Firefighters wear shiny silver clothing.*

Because they reflect the maximum amount of heat and thermal radiation from the fire.



*Solar water heater tubes are painted black.*

Because the black color absorbs the maximum amount of heat energy from the sun's rays, the water heats up faster.



*It's best to wear opaque clothing in the winter*

*because it absorbs infrared radiation better, making us feel warmer.*

## *Technological Applications*

Hot objects are a source of infrared radiation, which helps us photograph objects in the dark using a thermograph.

The thermograph: *A camera can detect the thermal radiation emitted by objects (infrared radiation) and convert it into color images.*



The colors of the images depend on changes in the object's temperature.

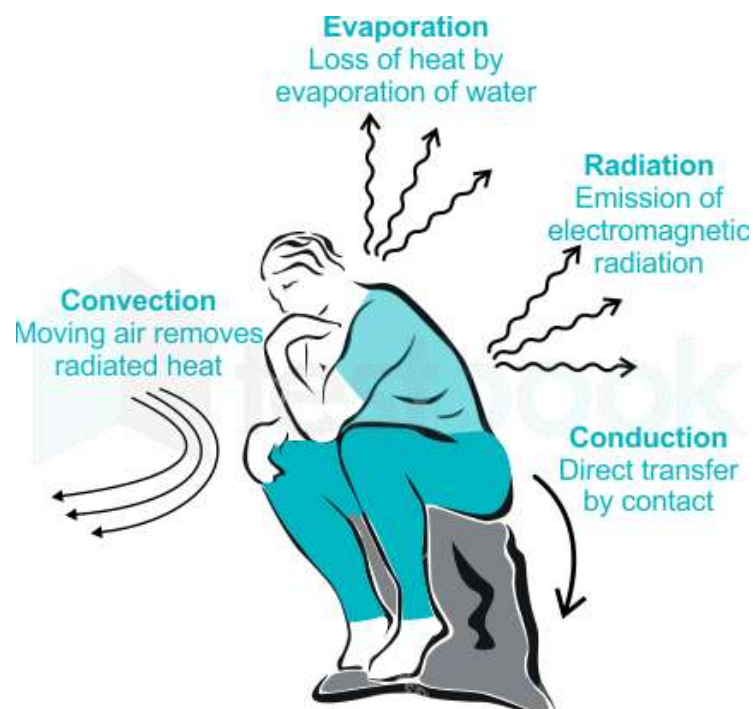
**Importance:** These cameras are used for:

1. Photographing in the dark.
2. Detecting the temperature of objects.

### Integration with Biology

Snakes are able to hunt their prey at night.

This is because they have **sensory receptors** in the front of their heads that enable them to detect infrared radiation emitted by their prey's bodies.





## Questions

### Write the scientific term:

- (1) Energy transferred from one system to another due to a difference in their temperatures. (.....)
- (2) The state reached by two systems of different temperatures after contact, when their temperatures are equal. (.....)
- (3) The transfer of thermal energy through solids without the movement of their particles. (.....)
- (4) A measure of the ability of materials to conduct heat. (.....)
- (5) The transfer of thermal energy in fluids with the movement of their particles. (.....)
- (6) The movement of cold air from the sea during the day toward land. (.....)
- (7) Waves that propagate in a vacuum in all directions at a speed of 300,000 km/s. (.....)
- (8) The transmission of infrared radiation from the surfaces of hot objects without the need for physical particles. (.....)
- (9) A technique that uses a camera to sense the thermal radiation emitted by objects & convert it into color images. (.....)

### Correct the underlined:

- (1) Heat is a form of matter. (.....)
- (2) Heat is transferred through solids from one end to the other by convection. (.....)
- (3) When two identical copper cubes, the temperature of one being 60°C and the temperature of the other being 400°C, come into contact, their temperature at thermal equilibrium becomes 200°C. (.....)
- (4) Copper ranks first in thermal conductivity among natural elements. (.....)
- (5) When heat is transferred by radiation, hot water particles rise upwards and cold water particles sink downwards. (.....)
- (6) The effect of the sea breeze phenomenon is more pronounced in the spring. (.....)
- (7) Infrared radiation has a chemical effect. (.....)

(8) The idea of wearing clothing in the winter is based on heat transfer by conduction. (.....)

(9) When we stand in front of a light bulb, heat is transferred to us by conduction. (.....)

**Put (✓) or (X):**

(1) The transfer of thermal energy from one system to another depends on a temperature difference between them. ( )

(2) Heat is transferred from a colder body to a hotter body. ( )

(3) A spoon becomes cold after being used to stir iced water in a cup because the spoon loses heat to the iced water. ( )

(4) When a cube of metal at  $60^{\circ}\text{C}$  is dropped into a tub of water at  $90^{\circ}\text{C}$ , the temperature of the water does not change. ( )

(5) When stirring a cup of hot tea with a metal spoon, heat is transferred to the hand by radiation. ( )

(6) Thermal equilibrium occurs when there is a difference in the amount of heat. ( )

(7) Metals are thermally conductive materials. ( )

(8) Copper has a greater thermal conductivity than silver. ( )

(9) Solid bricks have better thermal conductivity than hollow bricks. ( )

(10) The heat generated in smartphone components leads to poor performance. ( )

(11) Heat is transferred through solids and liquids by convection. ( )

(12) When air cools, its density decreases and it sinks. ( )

(13) An electric heater is placed on the floor of a room to heat the air by conduction. ( )

**What is meant by each of the following:**

(1) Heat.

(2) Thermal equilibrium.

(3) Thermal conductivity.

(4) Thermal conductivity

(5) Convection.

(6) Sea breeze.

(7) Radiation.

(8) Electromagnetic waves

**Give Reason for:**

(1) The temperature of a cold solid object rises when it comes into contact with a hot piece of iron.  
.....

(2) The temperature of a hot piece of metal decreases when placed in a cup of cold water.  
.....



## Matter & Chemical Reactions

### L1: Chemical Reactions

#### Chemical Reaction

We previously learned that matter undergoes various types of changes that affect it in multiple ways. These changes are divided into two types: *Physical changes and chemical changes.*

A comparison can be made between a physical change and a chemical change, as shown in the following table.

| Physical Change                                                                       | Chemical Change                                                                                        |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| A change in the state or form of matter without a change in its chemical composition. | A change that produces new substances with different chemical properties from the original substances. |
| Melting ice - Dissolving salt in water - Cutting tomatoes                             | Wood burning - Fruit rot<br>Iron rust                                                                  |
|    |                    |

A chemical change occurs when original substances react chemically with other substances to form new compounds.

## The concept of chemical reaction

**Tools:** Baking soda (sodium bicarbonate) - Vinegar (diluted acetic acid) - Balloon - Empty bottle - Spoon.

### **Steps**

1. Put two tablespoons of baking soda into the balloon.
2. Put a quantity of vinegar into the bottle.
3. Tightly secure the balloon's opening to the bottle's mouth, being careful not to spill any of the baking soda into the balloon.
4. Lift the balloon and let the baking soda fall into the solution in the bottle.



**Note:** Fizzing and gas will occur.

The balloon will gradually begin to inflate due to the gas produced by the reaction.



**Conclusion:** A chemical reaction between baking soda (sodium bicarbonate) and vinegar (dilute acetic acid) resulted in fizzing and the release of carbon dioxide gas (a new substance). Therefore, this change is considered a chemical change.

**Chemical Reaction:** The process of breaking the bonds between the atoms of the molecules of the reactants and forming new bonds between the atoms of the molecules of the substances resulting from the reaction.

A chemical reaction occurs when reactants combine, dissociate, or replace each other to form new products.

### **Steps of a chemical reaction:**

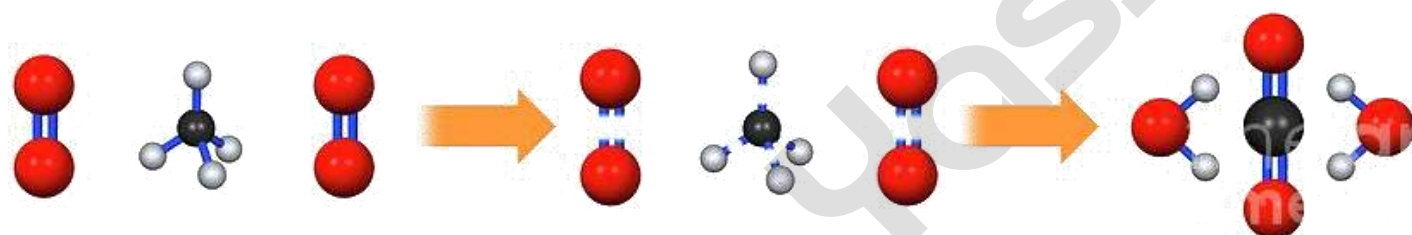
1. Breaking the bonds between the atoms of the reactant molecules.
2. Rearranging the atoms and combining them with new bonds to form new substances with different properties from the original substances.





## Example:

The combustion of methane gas ( $\text{CH}_4$ ) in the presence of oxygen gas ( $\text{O}_2$ ):



Reactants before  
the reaction  
occurs.

Breaking the bonds  
between the atoms  
of the reactant  
molecules.

Formation of new  
bonds between the  
atoms of the  
product molecules.

In the previous reaction, bonds between the atoms of methane gas molecules and also between the atoms of oxygen gas molecules broke. The atoms rearranged and combined with chemical bonds to form new compounds: carbon dioxide ( $\text{CO}_2$ ) and water vapor ( $\text{H}_2\text{O}$ ).

- The color change of a universal indicator strip when exposed to ammonia gas is considered a chemical change.

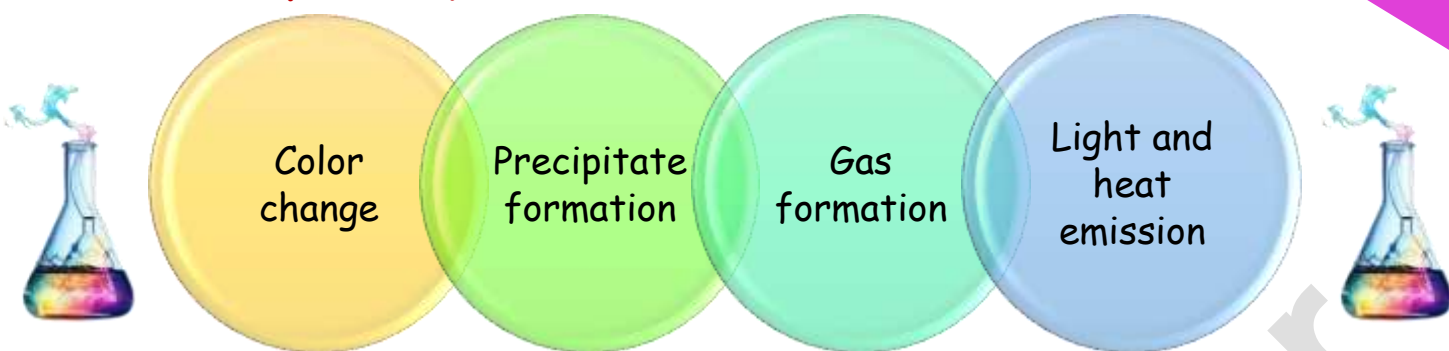
A chemical reaction occurs between the indicator material and the ammonia gas, resulting in the formation of a new substance with a different color.

- The clouding of limewater when carbon dioxide gas is passed through it is considered a chemical change.

A chemical reaction occurs between the gas and the limewater solution, resulting in the formation of a new substance that is insoluble in water.



## Indicators of a chemical reaction

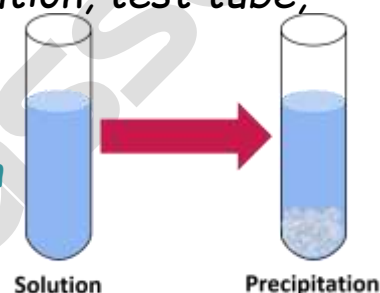


### Precipitate formation activity

**Tools:** Sodium chloride solution, silver nitrate solution, test tube, dropper.

**Steps:**

1. Place a small amount of sodium chloride solution in the test tube.
2. Add drops of silver nitrate solution.



**Note:** A reaction occurs and a white precipitate is formed.

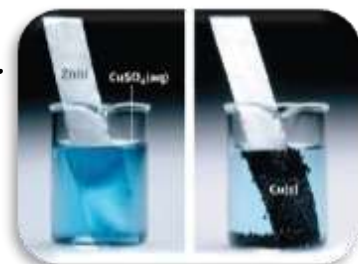
**Conclusion:** A chemical reaction occurs when silver nitrate ( $\text{AgNO}_3$ ) solution is added to sodium chloride ( $\text{NaCl}$ ) solution, resulting in the formation of a white precipitate of silver chloride ( $\text{AgCl}$ ), which is insoluble in water and changes color to purple in sunlight.

### Activity: Color Change

**Tools:** Glass beaker, zinc plate, copper sulfate solution.

**Steps**

Put the copper sulfate solution into the beaker.  
Place the zinc plate in the solution.



**Note:** The blue color of the copper sulfate solution disappears and a reddish brown color appears on the zinc plate.

**Conclusion**

The chemical reaction between the zinc ( $\text{Zn}$ ) plate and the copper sulfate ( $\text{CuSO}_4$ ) solution is indicated by:

The blue color of the copper sulfate solution disappears, leaving the zinc sulfate ( $\text{ZnSO}_4$ ) solution colorless.

Reddish-brown copper deposits on zinc plate



## Gas formation activity

**Tools:** Magnesium strip - dilute hydrochloric acid - test tube.

### Steps:

Place the magnesium strip in a test tube.

Add dilute hydrochloric acid to it.

**Note:** Reaction and the formation of gas bubbles.

**Conclusion:** A chemical reaction is indicated when dilute hydrochloric acid (HCl) is added to magnesium (Mg) by the formation of gas bubbles from the evolution of hydrogen gas ( $H_2$ ).



## Activity: Emission of light

**Tools:** Magnesium strip - water - mask - flame.

### Steps

Hold the end of the magnesium strip with the holder.

Ignite the end of the strip with a flame.

Dip the resulting powder into the water.



**Note:** A reaction occurs, and the magnesium ribbon glows with a dazzling light, accompanied by the emission of heat.

The resulting white powder dissolves in water.

### Conclusion

A chemical reaction is indicated when a magnesium (Mg) ribbon is ignited by the ribbon glowing brightly, accompanied by the emission of heat. The magnesium ribbon is transformed into a white powder of magnesium oxide ( $MgO$ ), which dissolves in water.



## EXAMPLE

Copper chloride solution reacts with sodium hydroxide solution, forming sodium chloride solution and copper hydroxide, which is insoluble in water. **How can this chemical reaction be determined?**

A chemical reaction is determined by the formation of a blue precipitate of copper hydroxide, which is insoluble in water.



Sodium hydroxide solution ( $\text{NaOH}$ ) is added to both copper sulfate and ferrous sulfate solutions. *How can we distinguish between them, despite the formation of a precipitate in both cases?*

Because the color of the precipitate is different in both cases, with copper sulfate, a blue precipitate of copper hydroxide is formed, while with ferrous sulfate, a green precipitate of ferrous hydroxide is formed.

The rotting of an orange indicates a chemical reaction. *How can this reaction be determined?*

A chemical reaction is determined by the change in the color of the orange to a dark green color and the emanation of an odor from the rotting part.

When sulfuric acid reacts with baking soda (sodium bicarbonate), effervescence occurs and carbon dioxide gas is released. *How can this reaction be determined?*

This reaction can be determined by the effervescence and release of carbon dioxide gas.

## Cause

## Effect

A chemical reaction occurs.

Leads to the formation of a precipitate, color change, gas evolution, light and heat emission, extinguishing a burning match, or increasing the glow of a burning splinter.



## Laboratory Safety Precautions:

Laboratory safety precautions are essential to protect everyone from hazards and ensure a safe and orderly work environment. These include:

1. Use a protective mask to avoid the harmful effects of bright light.



2. Avoid touching the white powder formed immediately after the magnesium ribbon ignites in the air, as it will be hot immediately after the reaction.
3. Hold the magnesium ribbon with a heat mask to avoid burns during ignition.
4. Handle acids, especially concentrated ones, with extreme care.

## Properties of materials before and after a chemical reaction

The properties of materials **change** after a **chemical reaction** occurs, as the original materials are transformed into **new materials** that differ in color, shape, or other properties.

To learn about the differences in the properties of materials before and after a chemical reaction.

### Activity 1: Burning Sugar

**Tools:** Table sugar, spoon, flame

#### Steps:

Put a spoonful of table sugar.

Slowly heat the sugar by holding the spoon over a flame.

Observe and record the changes that occur.

#### Note

The sugar turns into a brown molten substance and begins to burn. A strong, caramel-like odor is produced.



#### Conclusion

When molten sugar burns, a chemical reaction occurs, as evidenced by: A strong odor (caramel smell) - Smoke - Color change - Formation of a new substance (carbon)

## Activity 2: The Reaction of Oil with Caustic Soda

**Tool:** Oil, glass beaker, caustic soda solution (sodium hydroxide), flame, stirring rod

### Steps:

Place 100 ml of vegetable oil in a 250 ml glass beaker.  
Add 30 ml of caustic soda solution (sodium hydroxide) to the oil, drop by drop.

Heat the mixture using a suitable heat source at 40-50°C, stirring the ingredients well in one direction.  
Observe and record the changes that occur.



**Note:** The consistency of the mixture changes and a new substance is formed as a result of a chemical reaction.

**Conclusion:** Adding oil to a caustic soda solution and heating it leads to a chemical reaction, evidenced by a change in consistency, and the formation of a new substance (soap).

We conclude from the previous activities that the properties of materials change when a chemical reaction occurs, as shown in the following table.:

| Burning sugar                                                                                                                  | Reacting oil with caustic soda                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Properties of substances before reaction                                                                                       |                                                                                                              |
| Sugar is white.<br>Solid.<br>Soluble in water.                                                                                 | Oil is a liquid (fatty) that does not dissolve in water.<br>Caustic soda is a solid that dissolves in water. |
| Properties of materials after reaction                                                                                         |                                                                                                              |
| A new, solid, brown substance is formed, which then turns black.<br>It does not dissolve in water.<br>It emits a caramel odor. | A new, sticky substance is formed.<br>Soluble to a certain degree in water, forming a foam.                  |
| a chemical reaction occurred.                                                                                                  |                                                                                                              |



## Evidence of a chemical reaction.

A strong odor (caramel smell) appears.

Color change.

Smoke.

Formation of a new substance (carbon).

Change in texture.

Formation of a new substance (soap).

## Chemical Reactions in Life

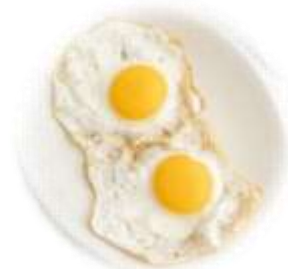
Chemical reactions are an integral part of our daily lives. They occur everywhere around us, from cooking food and breathing to cleaning the house and celebrating with fireworks.

### Examples of chemical reactions in our daily lives:

#### 1. Cooking Food

**Example:** When frying eggs, a chemical reaction occurs.

Evidence of a chemical reaction: A **change in the color and texture** of both the white and yolk.



#### 2. Fruit color change

**Example:** When you cut an apple, a chemical reaction occurs with the oxygen in the air.

Evidence of a chemical reaction: The apple turns brown.



#### 3. Iron rust

When iron is exposed to oxygen in moist air, a chemical reaction occurs, causing the iron to rust.

Evidence of a chemical reaction: a change in the color of the iron.



#### 4. Fireworks

When fireworks ignite, a chemical reaction occurs.

Evidence of a chemical reaction is the emission of **light and heat**.



## Questions

### Write the scientific term:

- (1) A change in the state or form of a substance without changing its chemical composition. (.....)
- (2) A change that produces new substances with properties different from those of the original substances. (.....)
- (3) A gas produced by the reaction of sodium bicarbonate with dilute acetic acid. (.....)
- (4) The breaking of bonds between the atoms of the molecules of the reactants and the formation of new bonds between the atoms of the molecules of the products. (.....)
- (5) A white precipitate that turns purple when exposed to sunlight. (.....)
- (6) A solid substance produced by the reaction of oil with a caustic soda solution. (.....)
- (7) The color of iron changes when exposed to oxygen in the humid atmosphere. (.....)

### Correct the underlined:

- (1) A chemical reaction between sulfuric acid and sodium bicarbonate is indicated by the formation of a precipitate. (.....)
- (2) When silver nitrate solution is added to sodium chloride solution, a white precipitate of sodium nitrate is formed. (.....)
- (3) When magnesium oxide is exposed to sunlight, it turns purple. (.....)
- (4) Copper sulfate solution is colorless. (.....)
- (5) The scientific name for caustic soda is sodium bicarbonate. (.....)
- (6) Copper rusts when exposed to oxygen in moist air. (.....)

### Put (✓) or (X):

- (1) Physical changes do not alter the chemical composition of the substance. ( )
- (2) Melting wax produces a new substance. ( )
- (3) Chemical changes produce new substances with properties different from those of the original substances. ( )
- (4) The transformation of milk into butter is a physical change. ( )
- (5) The odors associated with cooking food are evidence of physical changes. ( )



(6) A change in color and texture over time indicates a chemical reaction. ( )

(7) All chemical reactions are accompanied by the formation of bonds between the atoms of the reactant molecules. ( )

(8) Magnesium oxide powder is white and insoluble in water. ( )

(9) Burning sugar changes its physical properties. ( )

**What is meant by each of the following:**

(1) Physical change.

(2) Chemical change.

(3) Chemical reaction

**Give Reason for:**

(1) The melting of ice is a physical change.

(2) The burning of wood is a chemical change.

(3) The shattering of a tightly sealed, filled water bottle when placed in a refrigerator is not a chemical reaction.

(4) Chemical reactions are accompanied by the formation of new substances.

(5) Effervescence occurs when sodium bicarbonate is added to acetic acid.

(6) A white precipitate is formed when silver nitrate solution is added to sodium chloride solution.

(7) The reaction of zinc with copper sulfate solution is indicated by the color change.

(8) Gas bubbles form when dilute hydrochloric acid is added to a magnesium ribbon.

(9) When burning a magnesium ribbon, a protective mask must be used.

(10) The white powder formed immediately after burning a magnesium ribbon should not be touched.

(11) The rotting of an orange when left for a long time is an indication of a chemical reaction.

حمل الآن

مجاناً وحصرياً

# المراجعة رقم (4)

اختبار شهر نوفمبر







## NOVEMBER REVISION

### Q1: Choose the Correct Answer

1. The substance used in manufacturing ice boxes must take a long time to lose heat, which means it should have a high specific heat. The substance most suitable is .....

- a. W (30 min)                      b. X (15 min)                      c. Y (60 min)                      d. Z (45 min)

2. An open pot of boiling water represents a system in which ..... are exchanged with the surroundings.

- a. only heat and not matter                      b. neither heat nor matter  
c. both energy and matter                      d. only matter and not heat

3. The internal energy of the system is equal to the summation of the potential energy and the kinetic energy of the particles. This summation is represented mathematically as: Internal energy = .....

- a. Total kinetic energy of particles / Number of particles  
b. Potential energy  $\times$  Kinetic energy (of particles)  
c. Potential energy + Kinetic energy (of particles).  
d. Kinetic energy of particles  $\times$  Number of particles

4. When a substance is heated, its particles increase their .....

- a. potential energy decreases.                      b. average kinetic energy increases.  
c. kinetic energy decreases.                      d. internal energy decreases.

5. The specific heat of a metallic ball depends on the .....

- a. type of its substance.                      b. its mass.                      c. its volume.                      d. its radius.

6. What is the relation between the closed system and the surroundings? Energy is exchanged between them but .....

- a. Matter and energy are exchanged between them.  
b. Matter is exchanged between them but not energy.  
c. Energy is exchanged between them but not matter.  
d. Neither matter nor energy is exchanged between them.

7. All the following are factors that affect the system's temperature, except its .....

- a. mass.                      b. type of its matter.                      c. shape.                      d. physical state.





8. Heat transfers through metallic objects by .....

- a. conduction and convection.      b. radiation only.      c. radiation and convection.      d. conduction only.

9. All the following are good heat conductors, except .....

- a. iron.      b. copper.      c. aluminium.      d. wood.

10. The state reached by two systems with different temperatures after they come into contact and their temperatures become equal is called .....

- a. Thermal insulators.      b. Specific heat.      c. Thermal equilibrium.      d. Thermal conduction.

11. Which method(s) of heat transfer is/are prevented by the vacuum (space) inside a thermos flask?

- a. Conduction and convection.      b. Conduction and radiation.  
c. Convection and radiation.      d. Radiation only.

12. When air heats up, its density decreases and .....

- a. its density decreases and goes down.      b. its density increases and rises up.  
c. its density decreases and rises up.      d. its density increases and it goes down.

13. Which of the following is a chemical change, except .....

- a. fruit rotting.      b. burning a piece of bread in the oven.  
c. explosion of an air-filled balloon.      d. conversion of the milk into yogurt.

14. Which of the following indicates the occurrence of a chemical reaction when iron rusts?

- a. Evolution of gas.      b. Colour change.      c. Formation of a precipitate.      d. Occurrence of effervescence.

15. The reaction of zinc with blue copper sulphate solution is indicated by the disappearance of the colour of the blue solution and the formation of .....

- a. reddish-brown precipitate.      b. gas bubbles of  $H_2$   
c. change in the volume of the substance.      d. emission of light and heat.

16. The average kinetic energy of water particles is the greatest at .....

- a.  $0^\circ C$       b.  $50^\circ C$       c.  $98^\circ C$       d.  $100^\circ C$

17. The tightly closed thermos flask represents system (X), while the hot tea cup represents system (Y). Which describes (X) and (Y)?

- a. (X): Closed, (Y): Open.      b. (X): Closed, (Y): Isolated.  
c. (X): Isolated, (Y): Open.      d. (X): Isolated, (Y): Closed.



18. When equal masses of water and ice are heated over a steady flame, the elevation in the temperature of .....

- a. water is the greatest.
- b. ice is the greatest.
- c. each of water and ice is the same in both cases.
- d. water is twice as that in the case of ice.

19. Which element heats up at a faster rate when equal masses of them are exposed to the same amount of heat for the same period of time? The element with the lowest specific heat, which is .....  
(Given specific heats: **Al**: 900, **Cu**: 385, **Fe**: 450, **C**: 710 J/kg.°C)

- a. Al
- b. Cu
- c. Fe
- d. C

20. In an electric kettle, the heating coil is placed near the base of the kettle, because hot water .....

- a. cold water rises up.
- b. hot water rises up.
- c. the kettle is a thermal insulator.
- d. water is a good conductor of heat.

21. Sea breeze occurs during the daytime because the land is hotter than the sea, causing .....

- a. the land is hotter than the sea.
- b. the land is cooler than the sea.
- c. air moves down to the sea.
- d. the land absorbs less heat than the sea.

22. Heat transfer by radiation occurs through .....

- a. liquids only.
- b. material and non-material media.
- c. gases only.
- d. metals only.

23. The internal energy of water increases when a quantity of water is heated from 20 °C to 30 °C, leading to an increase in the kinetic energy of the particles. This means the internal energy increases when .....

- a. the temperature of water changes from 70 °C to 60 °C.
- b. water vapour condenses on a plant leaf.
- c. a quantity of water is heated from 20 °C to 30 °C.
- d. the temperature of its particles decreases.

24. When an ice cube is placed in boiling water, heat transfers from water to ice until .....

- a. heat transfers from water to ice.
- b. water gains thermal energy from ice.
- c. water gains thermal energy from the surroundings.
- d. coldness transfers from the ice to the water.



25. During physical changes of a substance, all the following will change, except the .....

- a. the shape of the substance.
- b. the volume of the substance.
- c. the composition of the substance.
- d. the state of substance.

**Q2: Complete the following sentences**

1. Temperature represents how hot or cold the system is, and it is a measure of the average kinetic energy of the .....
2. The internal energy of a system depends on its temperature, its mass, its type of matter, and its .....
3. When equal masses of oil and water are heated by the same heat source, the temperature of the oil rises to a greater extent than that of the water because the specific heat of oil is ..... than the specific heat of water.
4. The amount of change in the temperature of different masses of the same substance varies when they gain or lose the same quantity of .....
5. When a substance (system) gains a quantity of thermal energy, the average kinetic energy of its particles ....., leading to a rise in the temperature of the system.
6. Systems are classified according to their ability to exchange energy and matter with the surroundings into open systems, closed systems, and .....
7. Heat is the energy that is transferred from one system to another due to the difference in their .....
8. The density of hot water is ....., while the density of cold water is higher.
9. The transfer of thermal energy through solid objects from one point to another without the particles moving from their positions is known as thermal .....
10. The state reached by two systems with different temperatures after they come into contact and their temperatures become equal is called thermal .....



11. Thermal conduction occurs in solid matters only, while thermal convection occurs in liquids and gaseous matters (fluids), and radiation occurs in gases and .....
12. The specific heat of a substance is a characteristic property and varies depending on the type of the substance and its .....
13. The kinetic energy of the particles of ..... matter is the greatest, because they move completely freely.
14. When air cools, its density increases and it sinks to the surface, but when air is heated, its density decreases and it .....
15. The transfer of thermal energy in fluids with the movement of their particles is called thermal .....
16. The specific heat of ice is ..... than the specific heat of liquid water.
17. The process of breaking the bonds between the atoms of the reacting substances and forming new bonds between atoms of the produced substances defines a chemical .....
18. Dissolving sugar in water is a ..... change, while burning the sugar is a chemical change.
19. The reaction of sodium bicarbonate with dilute acetic acid is indicated by the formation of ..... gas.
20. When silver chloride precipitate is exposed to sunlight, it turns from white colour to ..... colour.
21. The colour of copper sulphate solution is ....., while zinc sulphate solution is colourless.
22. The change that results in new substances whose properties differ from those of the original substances is called a ..... change.
23. In summer, we wear light-coloured clothes, and in winter, we wear ..... coloured clothes.



24. Water is used in the cooling system connected to car engines, known as the .....

25. Thermal energy is transferred from the ..... temperature system to the lower temperature system.

### Q3: Put True or False

1. An open system only exchanges matter with the surroundings. ( )
2. The thermos flask represents a closed system. ( )
3. The internal energy of any isolated system is constant. ( )
4. The temperature of a substance is a measure of the average kinetic energy of its particles. ( )
5. An increase in the average kinetic energy of the system's particles leads to an elevation in its temperature. ( )
6. The average kinetic energy of hot water particles is equal to the average kinetic energy of cold water particles. ( )
7. Heat transfer from or to an object is indicated by changing its temperature. ( )
8. The specific heat of a single substance varies according to its physical state. ( )
9. Mercury is an excellent cooling liquid. ( )
10. The elevation in the temperature of a substance decreases as its mass increases when it gains an amount of heat. ( )
11. Heat transfers through solid objects from one end to another by convection. ( )
12. Thermal equilibrium occurs when there is a difference in the quantity of heat. ( )
13. Heat transfers from the colder object to the hotter object. ( )
14. Metals are thermal conductors. ( )
15. Copper has greater thermal conductivity than silver. ( )
16. The thermal conductivity of solid clay bricks is better than that of hollow clay bricks. ( )
17. When standing in front of a lit bulb, heat transfers to us by conduction. ( )
18. Infrared rays have a chemical effect. ( )
19. Heat transfers through solids and liquids by conduction. ( )



20. When air cools, its density decreases and it moves downwards. ( )
21. The melting of wax results in a new substance. ( )
22. During physical changes, the composition of the substance remains unchanged. ( )
23. The change of milk into yogurt is a physical change. ( )
24. The phenomenon of sea breeze is based on heat transfer by radiation. ( )
25. The combustion of magnesium in the air is accompanied by the emission of light and heat. ( )

## Q2: Write the scientific term

1. Any part of the universe that is under study, where the changes in energy and matter are observed. (.....)
2. The space surrounding the system which can exchange energy or matter or both with the system. (.....)
3. A system in which neither energy nor matter is exchanged with the surroundings. (.....)
4. The summation of the potential and the kinetic energies of the particles of the system. (.....)
5. A measure of the average kinetic energy of the particles of a substance. (.....)
6. The quantity of heat required to raise the temperature of 1 kg of a substance by 1°C. (.....)
7. A change in the state or shape of a substance without changing its chemical composition. (.....)
8. A change that results in formation of new substances with properties different from those of the original substances. (.....)
9. The process of breaking the bonds between the atoms of the reacting substances (reactants) and forming new bonds between atoms of the produced substances (products). (.....)
10. The state reached by two systems with different temperatures after they come into contact and their temperatures become equal. (.....)
11. Energy transferred from one system to another due to the difference in their temperatures. (.....)



12. The transfer of thermal energy through solid objects from one point to another without the particles moving from their positions. (.....)
13. A measure for the extent to which a substance can conduct heat through it. (.....)
14. Substances that are poor heat-conducting substances (have low thermal conductivity). (.....)
15. Substances such as Aluminum and Copper which have high thermal conductivity. (.....)
16. The transfer of thermal energy in fluids with the movement of their particles. (.....)
17. Cool air blowing from the sea towards the land during the daytime. (.....)
18. Waves that propagate in space in all directions at a speed reaching 300,000 km/s. (.....)
19. The transfer of infrared radiation from the surfaces of hot objects without the need for material particles. (.....)
20. A technique that uses a camera to detect thermal radiation emitted from objects and convert it into coloured images. (.....)
21. A cooling system connected to car engines. (.....)
22. The appearance of strong odour when sugar is burnt. (.....)
23. The change of colour of apples when they are cut into slices and left in the air. (.....)
24. A system in which only energy is exchanged with the surroundings, but matter is not exchanged. (.....)
25. The phenomenon where hot air rises and is replaced by denser cold air, creating currents. (.....)

### Q5: Give Reason

1. A soft drink metal can is considered a closed system.

.....

2. The temperature of the system rises when it gains a quantity of thermal energy.

.....



3. Odours spread faster in hot air than in cold air.

.....

4. Mercury is used in thermometers.

.....

5. The freezer is installed at the top of the refrigerator.

.....

6. It is preferred to place the electric space heater on the floor of the room.

.....

7. Water is considered an excellent cooling liquid.

.....

8. Why does the human body contain a large percentage of water?

.....

9. It is preferred to use hollow clay bricks in the construction of exterior walls rather than using solid clay bricks.

.....

10. The formation of gas bubbles occurs when dilute hydrochloric acid is added to a strip of magnesium.

.....

### Q6: What Happens If

1. The system gains thermal energy from the surroundings.

.....

2. Heating two equal masses of oil and water separately at the same temperature for an equal period of time using a steady flame.

.....

3. Two non-isolated systems with different temperatures come into contact with each other.

.....

4. A hot metal block is dipped in a beaker of cold water

(according to the temperature of both the metal mass and water)

.....



5. The end of a metal rod with small pins fixed on it with wax is heated.

.....

6. White silver chloride precipitate is exposed to sunlight.

.....

7. A piece of zinc is added to the copper sulphate solution.

.....

8. A piece of sugar is burnt until it forms a black substance.

.....

9. Polystyrene insulating panels are used between building walls during construction.

.....

10. The attraction forces between the particles of a substance become very weak, and the interparticle spaces become very large.

.....

### Q6: Compare between

1. A open system, a closed system, and an isolated system in terms of definition and an example of each.

.....

2. Solid matter and gaseous matter in terms of potential energy of the particles and kinetic energy of the particles.

.....

3. Thermal conductors and thermal insulators in terms of Definition and Examples.

.....

4. Heat transfer by conduction and heat transfer by convection in terms of the way heat transfers and the medium where it occurs (in two points only).

.....

5. A Physical change and a Chemical change

.....



# كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

